

Quantitative Texture Analysis of Thin Films from Diffraction Patterns

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Quantitative Texture Analysis (QTA) of thin films and thin structures has been for decades a challenge, mainly because either of the strong substrate influence, giving rise to heteroepitaxy, or of the lack of proper instruments and calculation methodologies. Usual instruments operated for texture analysis, generally poorly filtered radiation, proved to be inadequate for measuring samples which are made of one volumic single crystal and a thin layer. The unnecessary signal from the single crystal polluted the important one from the film via Bremstrahlung, giving unexploitable patterns and pole figures. The use of well monochromatized radiations avoided this problem, and 4-circle diffractometers equipped with point detectors started to provide QTA on not-too-much complicated heterostructures. However, the use of one-dimensional detectors appeared few years ago to be essential to carry out correct QTA on more complicated heterostructures, i.e. several thin films of different structures, with a single crystal as a substrate, with strong overlaps intra- and inter-phases ...

I found interesting to bring the audience from the starting point of QTA of thin films when the problems appeared, to the state-of-the-art methodology, thereby illustrating the main mistakes that one can do when carrying out such analyses.

The fundamentals of QTA will be given throughout the lecture, from simple examples to more sophisticated examples, to finally highlight why the combined approach appears as a real necessity (and not only for thin films !).

The lecture will roughly be organised as follows:

- Objects needed in QTA, pole figures, orientation space
- From measured to quantitative data (defocusing, volume, absorption, fluorescence ... corrections)
- Initial texture measurements, problems with thin structures
- Controlling the need of our experiments
- Formalisms of QTA, why using the WIMV approach
- Simulating ideal orientations
- Simulating some physical properties
- Why do we need to combine texture and the rest ...

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